



XV-15 Noise Reduction Test

What's Happening in the 80x120 Wind Tunnel?

By Mark Betzina

The National Full-Scale Aerodynamics Complex is an ideal facility for large-scale tilt-rotor research. Currently Ames and the NFAC are continuing their long history of contributions to tilt-rotor development. Tilt-rotor aircraft, such as the XV-15 and V-22, has the ability to land and take-off vertically (similar to a helicopter), and then cruise very efficiently at a higher speed than a helicopter when the rotors tilt over to act as larger propellers. Experimental and computational investigations in tilt-rotor aeromechanics is a major component of the current research efforts in the Aeromechanics Branch (Code ARA) of the NASA/Army Rotorcraft Division.

Tilt-rotor noise reduction is being investigated in the 80x120 Wind Tunnel using an XV-15 rotor system mounted on the Ames Rotor Test Apparatus (RTA). The RTA, having been first installed several years ago, seems like a permanent fixture in the test section. This test program was operating in the facility when the NFAC fan blade cracks were discovered over two years ago. Some valuable hover testing was accomplished during the blade repairs, but the primary noise reduction objectives could not be completed until the facility became operational again. The program resumed forward flight testing in November 1998 following the facility Integrated Systems Test (IST). It was well worth the wait, with the current test resulting in very significant reductions in tilt-rotor Blade Vortex Interaction (BVI) noise.



XV-15 Noise Reduction Test in the 80x120 Wind Tunnel

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WWII POWs Visit Ames

By Veronica Goldman



The group in the 80x120 Wind Tunnel in front of the XV-15 test

It is not often that we meet people who touch our hearts with the stories of their lives. But when it does happen, it is appreciated and not forgotten. This is the feeling four Ames employees will continue to share for a long time to come. On April 28, 1999, Dan Bufton, Steve Ord, Rich Ross, and Charly Rowlands hosted nine veterans, some with their wives, on a tour of different Wind Tunnels, Flight Simulators, and NASA Ames facilities. How was this tour different than many others that are given at Ames every year? This tour had a special meaning, to the guests as well as the tour guides.

These nine men, now in their 70s, are former World War II POWs. When they were in their 20s these men went to war, as aviators, to protect and serve their country. They were shot down in action over Europe and incarcerated at a POW camp in Barth, Germany. They didn't know each other before the war, but in the camp, they learned to appreciate one another and their lives more fully. When the war was over, the nine that survived were liberated, and shared a similar goal; live life to the fullest, and to be thankful and enjoy each day.

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**Inside: Fan Motor Repair * Trap Wing Test * Business Development Initiatives
* Wind Tunnels: A Profitable Enterprise * Injury-free Environment * EOTM Awards**

Team Work Speeds up Fan Motor Repair

On April 9th, a loose bolt head was found at the bottom of one of the NFAC Main Drive fan motors. Poles, which are part of the rotors of the fan motor, are held in place by four such bolts. An inspection discovered a flaw in the original design of the motors, which were installed in 1979. Facing the risk of more bolt heads coming loose, the decision was made to replace a total of 960 bolts in 6 Drive motors. Because the bolts are all welded into place, this project became a large undertaking.

After a more thorough inspection, cracked amortisseur bars were also discovered. In fact, 18 poles were found in four different motors that had cracked bars. This led to the realization that the poles were going to have to be pulled and sent to the shop for repair. To correct these original design problems, a new, special washer that was curved on both sides was fabricated for each bolt. This design change to the motors, plus the shipping out, repair, and reinstallation of the poles added up to two months of work.

During this time, a tremendous team effort was in effect to complete the repairs as quickly and as efficiently as possible. People from all ends of Ames were involved in this project. These included telemechanics, and Sverdrup contractor mechanics whose tasks were removing and reinstalling the poles and doing some of the bolt and washer installation.

Civil servant mechanics completed much of the bolt installation and prep work. Because all of the old bolts were welded, mechanics had to go through with a grinder and cut the welds out to be able to remove each bolt. It was not possible to take out the poles by hand because of their great weight, so A-frames were built to support the poles during removal and reinstallation. The bolts were covered with Glyptal paint that also had to be sanded off. When it was suspected that the paint might have lead in it, code DQ tested the paint for lead content, and found people to remove it.

Though the idea of using an outside contractor, such as Westinghouse, was evaluated and later rejected, the decision to do repairs using

Ames employees saved approximately \$300,000. Through the two month period, everyone worked extremely hard to get the facility running again. "Everyone is contributing above and beyond what's expected. This is all new stuff, and not something we do every day. Everyone has been really careful, working safely, with no injuries. It's been great!" said Rusty Hunt, Project Leader.

During the pole replacement and part of the bolt replacement, many people worked very hard and were very professional, according to Hunt. Sverdrup mechanics worked several weekends on this project. The metal fab shop, the model shop and machine shop have all done whatever was needed and also put in a lot of weekends and overtime. The civil servant mechanics, whose job does not include repairs of this nature, helped immensely, and put in the same kind of extra hours.

As the job grew, more tasks were assigned to engineers who have also worked exceedingly hard. Dave Brown was responsible for the replacement of the bolts, and Lich Tran for the poles. Lew Mermelstien did an outstanding job leading the later testing. Janet Beegel wrote the test plan. "The safety crew, especially Jason Brown, has been involved all the way through in keeping us out of trouble, and management has really helped a lot. They have provided all the resources that were needed to keep things moving," said Hunt. "I

have gotten terrific support for getting things done. Which has made it a lot more fun."

Many others also helped to make the effort move along quickly. Some of these people included Jim McCuster who did the electrical parts inspections and coordinated the work for the pole replacement. He coordinated and supervised the motor repair shop that was doing the repair on the poles themselves. Bob Serrert helped to establish all of the QA procedures. Bob Olgiati was responsible for expediting. "Whenever anything was needed: wrenches, hoists, dust masks, he was one-stop shopping. In a way he was the field work coordinator", said Hunt. In addition, good documentation of the repairs will allow people in the future to go back to the records and understand what was done and why.

There were many people involved in this repair project, all trying to get it done as quickly and efficiently as possible. Their effort and dedication is greatly appreciated, and has paid off. The Repairs are finished with the facility up and running.

By Veronica Goldman



Fan Motor 3 includes new bolts, poles and a-frame built for this repair



Pole installation using the A-frames



Rusty Hunt (Project Leader) in front of Fan Motor 3

Business Development Initiatives

By Phil Stich

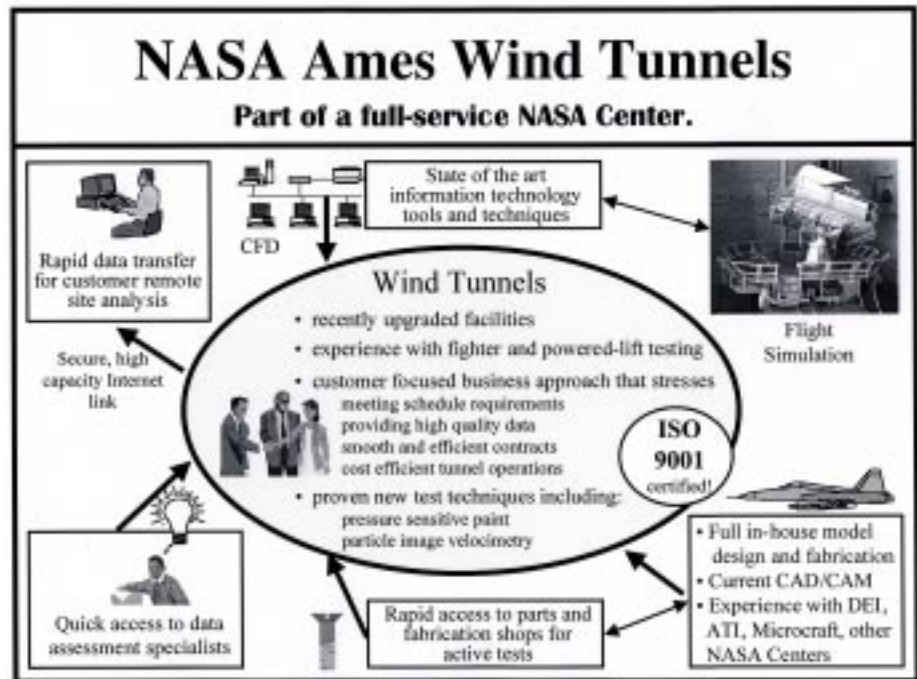
The changing business environment in the global aerospace industry has caused a major change in the way that aeronautical test services are contracted. Government-owned test facilities are being transformed into business-like vendors of (wind tunnel) testing services. We are in a global competition for the shrinking aero test workload. This is not necessarily a bad situation, but rather an opportunity to excel.

NASA /Ames has outstanding people who operate several of the finest wind tunnel test facilities in the world. This makes us a strong contender for future work. We cover the testing range of low-speed to supersonic for development and production testing capability. Superior support services within Ames include model design and rapid fabrication, computational capability for complex configurations, information technology for data transmittal to customers, and advanced test techniques such as Pressure Sensitive Paint and Liquid Crystal, for studying flow phenomenon.

But just because we have a great product doesn't mean that the work will automatically flow to our doorstep.... We must do what other businesses do in a competitive environment...Market...

(officially called Business Development)!! FO has had a Business Development team working diligently for the last several months. This group has been focused on upcoming competitive bids to support the next phase of the Joint Strike Fighter, but has also been developing general marketing materials as well. Electronic presentations and marketing brochures are being produced as communication tools for our testing services.

Our most effective marketing tool is you, the members of the FO team. Outstanding technical performance is not always enough to attract and retain customers. Some of the "soft-sided" factors such as customer relations and communications play a significant role in overall customer satisfaction. You are encouraged to do your part to make Ames the Aerospace Test Facility of Choice among aircraft developers.



XV-15 Noise Reduction Test...

This test is funded by the Short Haul Civil Tilt-rotor (SHCT) Project, which is an element of the Aviation Systems Capacity Program. Noise is a key issue for the future of commercial tilt-rotor aircraft. BVI occurs during descending flight conditions typical of landing approach, creating high noise levels under the path of the aircraft. A future vision for these aircraft is that they will fly into city centers and land at vertiports on top of buildings, thus relieving congestion at the major airports. BVI noise reduction is considered an important technology enabling this vision.

"The Most Successful noise reduction technique found during the current test was Higher Harmonic Control ."

The most successful noise reduction technique found during the current test was Higher Harmonic Control (HHC). This technique used the unique capabilities of the RTA's dynamic control system to make dynamic inputs to the rotor blade pitch controls at 3/rev frequency in the non-rotating system. BVI noise reduction was demonstrated with both open-loop and closed-loop control. It was also shown that both noise and vibration could be reduced simultaneously.

Two more weeks of testing with the 3-blade XV-15 rotor are scheduled in June. Flow visualization will be a major objective, utilizing both a laser light-sheet visual system and a Planar Doppler Velocimetry (PDV) system to identify the blade/vortex interactions producing the high noise levels. Then a 4-blade hub will be installed and a 4th XV-15 blade will be used to investigate the effects of a 4-blade tilt-rotor on blade/vortex interactions. This portion of the program is scheduled for two weeks of operation in August after which the RTA will finally be removed from the test section, ending its record-setting tunnel occupancy duration. The RTA is planned to undergo a major refurbishment, preparing it for future rotor testing in the NFAC.

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12' Test of the AST Trap Wing Model

Within the Integrated Wing Design element of NASA's Advanced Subsonic Technology program, a need was identified to improve both the fidelity and turn-around time of CFD codes to help achieve program goals for reducing design-cycle time. A problem hampering the development and validation of high-lift CFD codes is the absence of detailed experimental databases for relatively generic (or "simple") high-lift configurations. In addition, typical tests gather force and pressure data, but do not yield insight into flow-field characteristics such as transition, boundary layer development, wake confluence, and separation. These "low-level" characteristics are important for the CFD developer to understand and ensure that he is correctly modeling the physics of the flow around a model.

A 10-week, single-shift test of a high-lift Trapezoidal Wing semi-span model was recently conducted at the Ames 12' PWT. The original wind tunnel model was a symmetric 35% scale 7J7 horizontal tail. The model was highly modified to convert it to a "simple" high lift geometry – one consisting of a full-span (root to tip) slat, main element, and flap. A partial-span flap was also built for this model to represent a more typical high-lift flap definition. A successful "shakedown" test of this model was conducted in the LaRC 14x22 FST in September 1998. The goal of the test was to check out the model and supporting systems in an atmospheric facility before subjecting it the high-pressure environment of the 12' PWT. The procedures developed and lessons learned during the 14x22 test were a major factor in the success of the 12' test.

The objective of the Ames test was to gather extensive data at several Reynolds numbers to support CFD code development and validation for high-lift analyses. This data included not only force and pressure data, but also temperature-sensitive paint (TSP) application for transition detection, fluorescent



Trapezoid Wing test model in the 12ft Wind

mini-tufts to provide qualitative stall-progression data, 7-hole probes that traversed boundary layers and wakes at several locations on the wing, and Video Model Deformation (VMD) measurements to provide twist and bending information for the model under load. This combination of data sources will provide the CFD developer with unprecedented aerodynamic detail for a high-lift configuration from which CFD codes can be

developed and refined to more accurately compute high-lift flow results.

All of the major test objectives were accomplished. Data was gathered for Reynolds numbers ranging from 3.5×10^6 to 14.7×10^6 for both the full-span and part-span flap configurations. Reliability and efficiency of the facility were major factors in the ability to gather the diverse array of data that was specified for the test. The TSP images provided clear indications of transition. The data can be further quantified to provide transition locations in model coordinates.

Mini-tuft data provided very clear stall progression patterns for both the full-span and part-span flap configurations. The 7-hole probe traverser mechanism gathered boundary layer and wake deficit data at several locations on the model for both the full-span and part-span flap configurations. The VMD system provided wing-twist and element-deflection data that can be used to modify the CFD definition of the Trap Wing model to more accurately represent the model "as tested". All of this information will be extremely useful to the CFD developer in that it provides quantitative flow-field data that can be used to validate CFD codes for high-lift applications.

Data from the Trap Wing test has no restrictions on distribution. Final data is being prepared, and upon receipt will be organized into logical pieces for dissemination. A web site will be established where interested parties may download geometry definitions, test data, and documentation.

By Mike Madsen

Striving Toward an Injury-Free Working Environment

By Morrow Whitcomb

Safety is the single most important part of our jobs. When Dan Goldin came to Ames to congratulate the Center on becoming ISO Certified, he spoke extensively about safety. When the Government sent out the Request for Proposal on this contract last year, they mentioned safety again and again in every facet of the work statement. When the customer gave us our first award fee evaluation, our safety record reduced the score enough that we did not get the award fee profit sharing we all would have received for a score of 90% or better. When Jacobs acquired Sverdrup, they were concerned about our safety record, because it's below that of Jacobs even though Jacobs performs maintenance in very high-risk areas such as oil refineries. Since safety has such a high level of visibility with the Agency, the Center, the Customer, our corporate parent, and our management, it therefore becomes a primary goal of each one of us.

In the all-hands safety meeting a few months ago we heard Jerry Mulenberg discuss safety as a value. He meant that safety is an essential part of the product we deliver. It is part of the quality of the services we provide. If we have an injury during a major repair project, we have produced a low-quality product even if we finished ahead of schedule, under budget, and exceeded every other requirement of the project. Poor attention to safety indicates a casual approach to work in general, and when safety is poor, workmanship inevitably suffers, and other requirements are also missed.

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POWs Visit Ames... (continued from page 1)

"This group of individuals are at a different part of their lives."

After the war, they went their separate ways, and are spread throughout the United States. But as time passed they never forgot each other and every year they make an effort to have a reunion in a different place. This year they came to San Jose. One of the former POWs, Harry Slesnick, who now lives in Saratoga, was the sponsor of the reunion. A friend of Dan Bufton, Harry thought that a tour of Ames would be a very interesting and memorable trip for him and his friends.

The group showed up at 8:30 am on the day of their tour, ready to observe, learn, remember and enjoy. Their first stop was the Vertical Motion Simulator (VMS), where Scott Larwood showed the group around. At the time of the visit, the simulation was running, and by looking at the monitor, the group could see what was in the cockpit. "I think they enjoyed seeing that. It's not often you get to see the worlds' largest motion-based simulator actually operating", said Steve Ord. The next stop was the Crew-Vehicle Research Facility (CVSRF), where Bob Shipley took the time to show the different systems and how they work. Then on to NFAC, where Rusty Hunt took the POWs into the control room for the 80x120 WT, and then into the test section.

The tour was scheduled to take about 3 hours, but ran over, due to the captivating stories and memories that were shared by the former POWs. There were stories of survival, comrades dying, incarcerations, and much more. But there was no boasting, and no regrets "...while talking to all these people, the general perspective I was given was that they were all very humble, they didn't think that serving in a war was anything more than one of their responsibilities, or their duty to their country", said Dan Bufton, "and we can genuinely say that these folks have earned our respect, and that this tour was the least we could do."

"They were a very alive group of individuals," said Rich Ross, "They didn't consider themselves extraordinary, in any way, shape, or form, which was the most striking thing." The four tour guides realized right away that they were faced with a unique and exciting opportunity. They are used to giving lectures on what the facilities are, how they are used, etc. But in this case there was a lot of dialog between the guides and the visitors about their experiences ranging from surviving in a combat situation to being liberated by the U.S. army. "I think they were giving us a tour of WWII, while we were giving them a tour of the windtunnels." Said Ord.

This group of individuals are at a different part of their lives, than the usual students or engineers who take tours at Ames. These men had lived their professions, "and now are enjoying each other's company and enjoying the memories. They really are pretty grateful for the fact that they still have this period beyond the war, to enjoy the rest of their lives." said Bufton. Everyone was pumped and excited to give the tour, and meet these men, according to Steve Ord: "It was kind of like giving a VIP a tour."

After the group had left, the four tour guides were left to reflect and appreciate what they had just experienced. The answer to the question: What was the best and most important part of this tour? was the same from all: Getting to meet people like that. "These individuals are really fascinating with tremendous stories." said Bufton.

"Normally when I give a tour, at the end of it I feel really good if I feel like the people got some interest in aeronautics, maybe they'll give us public support, and you feel successful when that happens. With these guys, I think it was different. It felt like we had an experience." stated Ord. And so it is unlikely that this particular tour will soon be forgotten. Summing up the general feeling of the group, Dan Bufton simply stated "It was really a pleasure and an honor to meet these people." And all agree!

Contributions to Better Productivity During the Trap Wing Test

- * Hard work and dedication of the crew
- * Hours of overtime were put in (came in early and initialized the tunnel systems)
- * Overtime used in end of day to enable customers to finish a run series
- * Customers planned model changes to be after the running shift, so most of day shift was used for running
- * Significantly less downtime than any other test in this facility
- * People staying late included test engineers, tunnel operators, instrumentation technicians and engineers, and computer technicians
- * The computer and instrument technicians came in an hour early for the whole test to ensure that the data system was running and for the instrumentation technicians to begin the daily checklist
- * Minimal Standard Data System (SDS) problems compared to other tests
- * Held weekly teleconferences to discuss test plans and problems before the model arrived.
- * Quick response time to customer's request.



FR Sitting l to r: Armando Buenaventura, Jennifer Bradley, Ed Pasillao
SR Kneeling: Bob Wong, TomRomer, Dan Cooper
TR Kneeling: Jill Kulpinski, Horacio Chavez, Clinton Duncan
Jim Sadowski
Standing: Ralph Watson, Luther Jenkins, Mike Madson, Harry Morgan, Harold Reimer

Wind Tunnels: A Profitable Enterprise? The Changing Paradigm

This third in a series of articles takes a quick look at the changes we are making and the positive impact they're having on the swift, sweeping challenges facing our organization. The first article addressed the overall change in our industry from a "philanthropic government wind tunnel testing organization" to a "more self-sufficient business of testing services." The second addressed the FO Division Retreat and the established teams making changes that are shifting the paradigm. This article addresses some of those specific changes and their positive implications for the health of the division.

The recent Trap Z wing test in the 12' PWT and the NFAC motor repairs are excellent examples of the staff operating that facility in the new paradigm. The "Can Do" attitude expressed by each individual was great, and when asked what they did that was different from other tests and projects, the common thread through all of their responses was one of cooperation and team-spiritedness: "Everyone did what they had to do to make things work and get the job done." It seemed that every individual evaluated their tasks and asked themselves, "What can I do to make the entire process work more smoothly?," and "What can I do to make sure the customer is fully taken care of?" As everyone asks and follows through on these questions, our jobs naturally become more efficient and productive, and as we practice this, we become more experienced and more intelligent 'self-managers'.

Currently, FO's 'Division Retreat Teams' are working hard to make positive contributions to this new paradigm. The Business Development Team is focusing on the next large National test program, the Joint Strike Fighter(JSF), to be sure that we fully understand, meet and exceed customer requirements and are competitive with all our services.

"Each of us can make a difference continuing to efficiently improve our processes by coming forward with new ideas."

Meanwhile, the Process Improvement Team is working on improving a number of items, some of which include: better matching the scheduling of facility commitments with resource availability; Data systems development to make sure that we are efficient with our staffing levels and we are on the cutting edge of systems hardware and software applications; and Startup time reductions to shorten our time from start of shift to first data point.

The Management Team is busy developing and integrating with the Center a consistent and uniform project management approach that is standardized and will specifically tailor to our needs. This includes all detailed planning, scheduling, execution, and costing of division tests and projects.

In any organization these improvements are a significant benefit, but what's facing us gives these changes a sense of urgency, making them even more crucial. The focused programs for NASA Aeronautics have been canceled for next year (2000). Globally, there is more wind tunnel occupancy time available than there are wind tunnel tests to occupy wind tunnels. The larger aircraft companies are taking a "wait and see" attitude before committing to using our wind tunnels for their test programs.

The Unitary Modernization Project has run into some problems, causing delays and impacting the timely completion of the facility. The capable project team has been extremely diligent in their work to solve these problems.

All of these challenges put us in a race to compete for customer occupancy time. The 12' PWT is up and running making a big impact on our customers' desire to use this facility. The NFAC is now back on line. Each of us can make a difference continuing to efficiently improve our processes by coming forward with new ideas. The creativity from each of us is what makes the difference working in the new paradigm; from routine maintenance and the minor facility projects, to that final report and a customer's parting comment of: "This is the best test program experience we've had in all our years. We will be back!"

By John Allmen

Injury-Free Working Environment...

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The importance of safety goes beyond the considerations listed above. Each and every one of us is valuable as a person. Moreover, each of us is a vital member of a team with an important mission to accomplish. Not only do we not want to see our team members suffer the pain of an injury, but the direct consequence of an injury is the loss of that person's skill and knowledge from the team. This in turn handcuffs the team in accomplishing its mission.

Our goal is nothing less than injury-free work. To this end we need to keep safety at the forefront of our consciousness during every part of every task we perform. We need to ask ourselves "Will the outcome of my next action be safe?" We need to systematically identify and control hazards, and eliminate risky behavior. We need to look out for each other, observe our activities, and help each other to work safely. We must work together to develop and improve work plans and procedures, concentrating on safety.

We are beginning a program of safety training to give you the awareness needed to help you work safely. We are also starting some new systems for formally developing safe work plans. Our intent is not to burden you with additional paperwork, but to provide a structured process through which hazards can be identified and controlled, and protective equipment can be specified and made available in advance, prior to the beginning of the task.

FO OUTLOOK

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Employee of the Month Awards



Tom Lima

Recently, Tom Lima was asked to measure the gap between the rotors and the stators for the Unitary 3-stage compressor. After reviewing the request and the procedure required to perform the measurement, Tom recognized several potential hazards associated with the task. Tom took the initiative to highlight these risks and proposed alternative methods to perform the required measurements to the responsible engineers (Scott Richey and Frank Kmak). Thereafter he was instrumental in developing the new procedure, which proved to accomplish the task quicker than the previous plan and in a much safer fashion. Tom's ability to recognize and identify work hazards and to assist with developing safe alternatives should be commended and used as an example of how a safety culture should work.



Rob Jercinovich



Rob Jercinovich is recognized for his outstanding troubleshooting skills and dedication to data quality and customer satisfaction during the preparation and installation for the Trap Wing Test. Rob worked beyond the call of duty on the Trap Wing test at the 12' PWT. His willingness to work many hours of overtime at short notice and at great personal sacrifice demonstrates his dedication to data quality and customer satisfaction. This is a complex model requiring 30 PSI scanner modules and using a non-standard PSI configuration. The configuration is non-standard due to the fact that in certain model changes, one module is not used. Unfortunately it is not the last module in the chain that is deleted which caused a problem with the hardware configuration file. He isolated the problem and obtained necessary software support to fix it. Because of his ability to support complex tests and do them back to back, he makes a large contribution to the divisions effort to support wind tunnel tests.

Camilla Perez

Camilla Perez received the FO Employee of the Month Award for her outstanding contributions to addressing problems and finding alternate solutions to FO personnel needs in her role as the FO Personnel Specialist. Her customer-oriented point of view is one to copy and very refreshing. Her attitude is always something to the affect of "I'm sure we can find a way to do what you want." She was instrumental in guiding us through the WG promotions, and is currently working with us on the WG-GS conversions. As truly "one of us," Camilla is a wonderful member of our Division. A civil servant award is given to Camilla Perez for the month of February.



Mars Flyer Model

Gavin Botha and Janet Beegle

Nasa Ames recently participated in a preliminary design effort for a remotely piloted flight on Mars. The low density Mars atmosphere and unique flight parameters result in a challenging low reynolds number flight regime. Due to this fact, wind tunnel testing is critical to the success of the flight on Mars. Gavin Botha and Janet Beegle developed a complete test program including wind tunnel and flight testing, researching potential facilities and determining modifications necessary to meet Mars testing requirements. They also oversaw the design and fabrication of two full-scale models and aero-shells. For their outstanding work and dedication to the success of this project, both Gavin and Janet were awarded a Civil Servant of the month award for April.

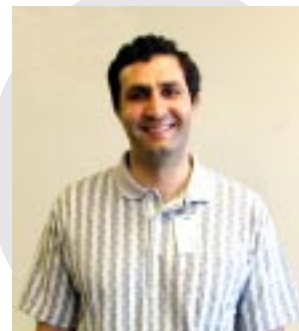


Employee of the Month Awards



George Swaiss

George is awarded a Contractor of the Month Award for his outstanding mechanical engineering support for the 12-Foot Pressure Wind Tunnel. George Swaiss could easily be nominated for Contractor of the Month most any month; his performance is consistently outstanding. In April he started and completed several independent projects. These included a comprehensive survey of lubricants used in 12' PWT mechanical systems to ensure proper maintenance procedures, to ensure proper identification for periodic chemical analysis, to identify appropriate substitutes and to evaluate compatibility with proposed Mars Flyer near-vacuum conditions. He also completed a review and correction of Alarm Response lists for the Total Temperature Controller (TTC) and Tunnel Pressure Controller (TPC) systems. This information will be incorporated into the 12' PWT Standard Operating Procedures (SOP) Manual and as a Westinghouse on-line reference.



Hiep Khuc

Hiep has been instrumental in completing the installation of the flexible cable tray in the south strut can at the 9 x 7 Ft Test Section. Since installation of the "Gortrac" assembly could not be performed while sub-system testing of the model support controls was in progress, Hiep scheduled this installation, when model support controls sub-system testing was shut down. Sub-system testing of the model support controls is on the critical path of the 9x7 Project Schedule, and any delay to the installation of the "Gortrac" assembly would have had a direct impact on the Project's critical path. Hiep worked an average of 12 hours a day to address issues that affected installation of the "Gortrac" assembly. With the completion of the "Gortrac" installation, the controls group was able to start the week with a full day of testing. If not for Hiep's efforts, sub-system testing would have been delayed because of the shut down of MCC-9.

Jennifer Bradley

Jennifer Bradley did an excellent job of coordinating requirements among the Trapezoid Wing test participants. The variety of activities and problems she encountered during model buildup and instrument checkout prior to moving into the test section would have challenged more experienced managers, but she was clearly equal to those challenges. Her documentation of plans and procedures, problems and solutions, results and analyses was clear and accurate. Her people-skills overcame the confusion associated with trying to satisfy multiple technical managers while directing technicians on short term rotating assignments from the Langley Research Center. She set daily objectives, monitored progress, and implemented corrective actions as needed. The test was completed on schedule, and productivity was higher than had been measured on any previous research program in this facility. All the User's technical requirements were met, and based on comments from the Post-Test Review, most of their expectations were exceeded.

